IN THE UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Re: Application of: Joseph E. Legare

Filing Date: Sept. 9, 2003

Serial Number: **10/657,189**

Group Art Unit: 3748

For: CONTROL METHODS FOR IMPROVED CATALYTIC CONVERTER EFFICIENCY AND DIAGNOSIS

Confirmation Number: 1625

Examiner: Diem T. Tran

APPEAL BRIEF UNDER 37 C.F.R. § 41.37

Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir/Madame:

This is an Appeal from the Non-Final Office Action mailed July 1, 2008 rejecting claims 1-9, 11-16, 18-20, 24-33, 36, 38-40, 43-46, 50, and 51 in view of the Applicant's Appeal Brief filed on January 22, 2008. A Notice of Appeal is being filed simultaneously herewith on July 28, 2008. This appeal is a reinstatement of the Appeal from the Final Office Action mailed May 17, 2007 rejecting claims 1-9, 11-16, 18-20, 24-33, 36, 38-40, 42-46, 50, and 51. The original Notice of Appeal from the May 17, 2007 Final Office Action was filed on September 17, 2007 and the corresponding Appeal Brief was filed on January 22, 2008.

BRIEF ON APPEAL

Pursuant to MPEP § 1204.01, the fee for filing this Brief on Appeal of $255.00 is covered by the fee paid for filing the Brief on Appeal associated with the original appeal associated with this application, filed on January 22, 2008. One copy of this Brief is enclosed.

REAL PARTY IN INTEREST

Based on information supplied by Appellant and to the best of Appellant's legal representative's knowledge, the real party in interest is Joseph E. Legare, the inventor, based on a Declaration dated 9/8/03 and filed on 9/9/03. To the best of Appellant's legal representative's knowledge, no Assignment has been executed or recorded in the USPTO for the present patent application and the real party in interest remains in the inventor, Joseph E. Legare.

RELATED APPEAL AND INTERFERENCES

There are no other related appeals or interferences known to Appellant or the Appellant's legal representative which will directly affect, be directly affected by, or have a bearing on the Board's decision in the pending Appeal.

STATUS OF CLAIMS

Pursuant to the Non-Final Office Action, mailed July 1, 2008, claims 1-9, 11-16, 18-20, 24-33, 36, 38-40, 43-46, 50 and 51 stand rejected and claims 10, 17, 21-23, 34, 35, 37, 41, 42 and 47-49 are objected as being dependent upon a rejected base claims (but would be allowed if rewritten in independent form to include all the limitations of the base claim and any intervening claims). In particular:

1. Claim 50 stands rejected under 35 U.S.C. § 102(b) as being anticipated by Yamashita et al. (U.S. Patent 5,727,383).
2. Claim 51 stands rejected under 35 U.S.C. § 102(b) as being anticipated by Pelters et al. (U.S. Patent 5,435,172).
3. Claims 1, 2, 7-9, 11-16, 18, 20, 29-31, 36, 38-40 and 43-46 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Maus et al. (U.S. Patent 5,610,844) in view of Pelters et al. (U.S. Patent 5,435,172).
4. Claims 24-26 and 28 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Fujimoto et al. (U.S. Patent 5,591,905) in view of Pelters et al. (U.S. Patent 5,435,172).
5. Claims 3-6 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Maus et al. (U.S. Patent 5,610,844), in view of Pelters et al. (U.S. Patent 5,435,172), and further in view of Holl (U.S. Patent 3,785,151).

6. Claim 19 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Maus et al. (U.S. Patent 5,610,844), in view of Pelters et al. (U.S. Patent 5,435,172), and further in view of Fujimoto et al. (U.S. Patent 5,591,905).

7. Claim 27 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Maus et al. (U.S. Patent 5,610,844), in view of Pelters et al. (U.S. Patent 5,435,172), and further in view of Yamashita et al. (U.S. Patent 5,727,383).

8. Claims 32 and 33 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Maus et al. (U.S. Patent 5,610,844), in view of Pelters et al. (U.S. Patent 5,435,172), and further in view of Yamashita et al. (U.S. Patent 5,727,383).

As a result, claims 1-51 are pending in the application and the rejections of claims 1-9, 11-16, 18-20, 24-33, 36, 38-40, 43-46, 50 and 51 are presently being appealed.

STATUS OF AMENDMENTS

Following the Final Office Action dated May 17, 2007, Appellant submitted a Response and Amendment on July 17, 2007 amending claims 1, 20, 24, 28, 29, 43, 50, to more clearly claim the invention and correct minor typographical errors noted by the Applicant. The Examiner issued an Advisory Action mail dated August 9, 2007 that refused to enter the Amendments filed on July 17, 2007 because they raise new issues that would require further consideration (to which the Applicant respectfully disagrees, but believes regardless all claims as presently pending in the form submitted herein are patentable). Therefore, the claims on Appeal are as filed on February 20, 2007 and are shown in the Appendix attached hereto.

SUMMARY OF CLAIMED SUBJECT MATTER

Concerning independent claims 1, 20, 24, 28, 29, 43, 50, and 51, each of these independent claims and their dependent claims may be read on nearly all of the figures (FIGS. 1-8B), all of their respective reference characters, and the paragraphs of the specification in their entirety, but are mostly directed to Figures 4A – 8B and the paragraphs in the specification related thereto.

The present claimed invention and patent application are primarily directed to two basic objectives; (1) to more quickly heat the catalyst after a cold start (a catalyst in this case may be, for example, a material (e.g. metal balls) housed in an automobile catalytic convert so that the catalyst is heated up quicker and help to more fully burn any unused fuel that is output by an engines cylinders, so as to reduce air pollution) of an internal combustion engine by more quickly heating the catalyst up to its activation and conversion temperature (used in, for example an automobile) so as to better diagnose the condition of the catalyst or to improve the initial pollution control performance of the system (e.g., to reduce air pollution emissions from automobiles) and (2) to more easily and cost effectively diagnose the continued acceptable performance of the catalyst so as to, e.g., continue to reduce air pollution emissions from automobiles by quickly heating a catalyst. As such, one approach of the invention provides various techniques for increasing the speed of heating a catalyst from an initial cold start condition (e.g., immediately after the automobile is started after sitting with the engine off for a long period of time) so that the better catalyst diagnosis may be performed and/or so that the catalyst is converting various gases more quickly. Another approach of the invention provides various techniques for easily, accurately, and cost effectively diagnosing the catalysts conversion capability during continuous engine operation so as to identify when the catalyst capability has degraded below a desired level of performance and needs to be changed. In various embodiments of the invention, the methods for accomplishing these objectives include the use of controlling the amount of gasoline injected into selected individual engine cylinders fuel (e.g., there are 4, 6, 8 or 12 engine cylinders in most automobiles) at particular times by individually controlling each of the fuel injectors connected to each of the individual engine cylinders.

With respect to catalyst diagnosis, one feature of the various embodiments of the Applicant's invention is providing a method for controlling individual engine cylinder's fuel injection quantities to affect an engine's exhaust gases' concentrations of gases, such as CO or oxygen, under steady state conditions during a controlled time period so as to cause catalyst heating. This feature can be accomplished by using the engine control unit (7) to control each fuel injector's (15) flow rate of fuel to selected individual or groupings of cylinders in order to cycle the selected individual cylinders' air-fuel conditions between predetermined rich and lean states. Figures 2 and 6 provide examples of selected individual engine cylinder control and the effect of cycling the fuel rate to selected groups of engine fuel injectors.

Another feature of the various embodiments of the Applicant's invention is providing a method for temporarily controlling defined changes of individual exhaust gases' concentrations to produce consistent catalyst temperature changes and allow diagnosis of catalytic converter malfunctions. Once again, the method of causing a change in steady state exhaust gas conditions is enabling of rich-lean cyclic fuel control that raises the levels of gases, such as CO and oxygen, at the catalyst surfaces. Engine control unit (7) may then determine whether the target catalytic converter (10) or (22) is malfunctioning by comparing changes between the first and second temperature characteristics as well as the first and second derivatives which comprise catalyst temperature profiles which may be compared to reference catalytic converters measured during similar steady state conditions representative of the two states.

With respect to cold start quick heating of the catalyst, another feature of the various embodiments of the Applicant's invention is to increase the rate of catalytic heating, particularly during open loop fuel control (although both during open and closed loop fuel control are possible as disclosed), at the earliest time when a catalyst's temperature is sufficient to allow sustainable exothermic reactions at portions of its active surfaces. This may also be used in determining the efficiency of the catalyst.

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Whether claims 1, 2, 7-9, 11-16, 18, 20, 29-31, 36, 38-40 and 43-46 are unpatentable under 35 U.S.C. § 103(a) over Maus et al. (U.S. Patent 5,610,844) in view of Pelters et al. (U.S. Patent 5,435,172).
2. Whether claims 24-26 and 28 are unpatentable under 35 U.S.C. § 103(a) over Fujimoto et al. (U.S. Patent 5,591,905) in view of Pelters et al. (U.S. Patent 5,435,172).
3. Whether claims 3-6 are unpatentable under 35 U.S.C. § 103(a) over Maus et al. (U.S. Patent 5,610,844) in view of Pelters et al. (U.S. Patent 5,435,172) and Holl (U.S. Patent 3,785,151).
4. Whether claim 19 is unpatentable under 35 U.S.C. § 103(a) over Maus et al. (U.S. Patent 5,610,844) in view of Pelters et al. (U.S. Patent 5,435,172) and Fujimoto et al. (U.S. Patent 5,591,905).

5. Whether claim 27 is unpatentable under 35 U.S.C. § 103(a) over Maus et al. (U.S. Patent 5,610,844) in view of Pelters et al. (U.S. Patent 5,435,172) and Yamashita et al. (U.S. Patent 5,727,383).
6. Whether claims 32 and 33 are unpatentable under 35 U.S.C. § 103(a) over Maus et al. (U.S. Patent 5,610,844), in view of Pelters et al. (U.S. Paten 5,435,172), and further in view of Yamashita et al. (U.S. Patent 5,727,383).
7. Whether claim 50 is anticipated under 35 U.S.C. § 102(b) by Yamashita et al. (U.S. Patent 5,727,383).
8. Whether claim 51 is anticipated under 35 U.S.C. § 102(b) by Pelters et al. (U.S. Patent 5,435,172).

GROUPING OF THE CLAIMS

Claims 1-9, 11-16, 18-20, 27, 29-33, 36, 38-40, 43-46, 50 and 51 do not all stand or fall together for purposes of the present appeal.

Claims 24-26 and 28 all stand or fall together for purposes of the present appeal.

Claims 10, 17, 21-23, 34, 35, 37, 41, 42 and 47-49 contain allowable subject matter and are therefore not discussed in the Argument section of the present appeal.

ARGUMENT

As a general matter, none of the cited and applied references presented by the Examiner can anticipate or render obvious any of the pending claims because they fail to disclose, teach, or suggest each and every limitation of the claims. None of the cited and applied references disclose, teach or suggest a method or system that can and does control conditions of "selected individual engine cylinders." Nor doe the Examiner provide any reasoning for modifying the disclosure of the references to do so. In particular, none of the cited and references have the hardware or software capable of controlling the conditions (e.g., amount of fuel or gas concentration) of "**selected individual engine cylinders**" as stated in the limitations of all of independent claims 1, 20, 24, 28, 29, and 43 (claims 50 and 51 will be discussed below). There are three primary inputs that can be controlled in an engine to achieve controlling the conditions of "**selected engine cylinders**" exhaust gases'; controlling the amount of engine inlet air, controlling the amount of fuel, or controlling the timing or extent of spark to ignite the air and

fuel mixture in the engine cylinder. In various embodiments of the present invention, the fuel control system includes one fuel injector per cylinder, i.e., injectors I1, I2, I3 and In, that each have independent control lines I1, I2, I3, and this hardware configuration enables individual cylinder selection such that each injector may be controlled independently and the amount of fuel to "selected individual engine cylinders" may be controlled independently to achieve the various purposes of the present invention (e.g., quick heating or diagnosis of the catalyst). The term "selected" requires an affirmative action of selecting. None of the references disclose, teach or suggest such individual cylinder selection, nor can they. Therefore, the systems disclosed by the prior art simply are not capable of achieving "selected individual engine cylinders" and can not and do not reasonably (without more teachings) anticipate or render obvious claims 1-49. Claims 50 and 51 are also patentable over the cited and applied references for other reasons.

Nor do any of the cited and applied references discuss early catalyst heating methods after cold engine starting, prior to closed loop feedback fuel control being enabled. This is another fundamental difference with respect to independent claims 24 and 28, which recite that the claims are directed to cycling of the oxygen sensor's output occurs "prior to stoichiometric closed loop fuel control operation" as it relates to controlling fuel into (or gases out of) selected individual cylinders. The following provides a more detailed explanation of the general points made above and subsequently each of the claim rejections will be addressed in order.

Furthermore, Applicant points out that in the Non-Final Office Action the Examiner failed to address numerous points of patentability that the Applicant identified and argued about for various dependent claims (e.g., claims 7, 30, 36, 38, etc.) in the Response and Amendments filed on February 20, 2007, and Pelters et al. fails to make up these deficiencies. With respect to numerous dependent claims, the Examiner has not addressed the various limitations of these claims and clearly failed to make a prima facie case for rejecting these claims, and thus these claims are presumptively patentable even though the Examiner has noted them rejected without any specific statement about why or how the claims are rejected. Applicant respectfully requests the Board to summarily note for the record the patentability of these claims or remand the case back to the Examiner to open prosecution so that the Examiner must provide the reasoning or withdraw the rejections, and the Applicant will be given the opportunity to enter any claim amendments that they believe may be helpful.

To establish prima facie obviousness, all the claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981 (CCPA 1974). All words in a claim must be considered in judging the patentability of that claim against the prior art." In re Wilson, 424 F.2d 1385 (CCPA 1970). (See MPEP § 2144.03.) No words in the claim can be ignored.

As indicated above, one of the purposes of the present application is providing an engine control system allowing an integrative control algorithm approach for improving catalyst diagnosis and catalyst effectiveness. This allows further reductions of toxic emissions entering the atmosphere from vehicles' tailpipes. Mainly this is accomplished by individual control of selected engine cylinders' exhaust gases' characteristics under a wide range of engine operating conditions, including near transient engine load state changes; to provide both catalyst heating and diagnosis. Catalyst temperatures are changed in a form of a step function control over an extended time period to allow large changes in the catalytic converter's temperatures, on the order of tens of degrees Celsius, in various catalyst partitions to be significantly increased due to the longer heating periods. This catalyst heating can occur over a time period of minutes versus only of seconds (Pelters at Col. 3, lines 48-53), as used in the prior art methods requiring ignition interruption due to the inherent limitations of this catalyst heating method. Catalyst heating is accomplished by producing an excess of oxygen and sufficient carbon monoxide or hydrogen based gases to be present in exhaust gas characteristics entering the catalytic converter to generate catalyst exothermic heating when it is in a chemically active state.

Unlike previous approaches found in prior art, catalyst diagnosis according to the present invention may include the critical cold engine starting time period before an engine's catalytic converter becomes fully effective due to its low operating temperatures. A temperature sensor placed in the catalytic converter provides catalyst temperature data used to both diagnose the catalyst's condition and control the heating method and is attained primarily through engine fuel control. A variation of the widely known Proportional-Integral-Derivative (PID) control system method is used in controlling engine operation. This results in catalyst heating and diagnosis over a wider range of operational conditions than employed in the prior art. Most prior art techniques are predominantly employing the dual oxygen sensor method of catalyst diagnosis that typically do not requiring direct catalyst temperature data.

The present patent application further includes methods of diagnosing catalytic converter NOx conversion effectiveness based upon catalyst temperature changes occurring when residual

exhaust gas concentrations entering an engine's cylinders are changed. Carbon monoxide levels and transient engine load fuel perturbations from steady state levels must be more carefully controlled than in prior art methods to accomplish such temperature based catalyst diagnosis.

It is telling and decisive that none of the prior art cited in the July 1, 2008 Non-Final Office Action pertaining to Pelters, Maus, Yamashita, Fujimoto or Holl provides a method or hardware configurations allowing control of selected individual engine cylinders' exhaust gases' characteristics to allow the catalyst diagnosis and early heating methods after cold engine starting, prior to closed loop feedback fuel control being enabled. Nor do any of the cited prior art methods by the Examiner (except an ambiguous comment about "cold-starting phase" requiring four catalyst temperature sensors in Maus at Col. 8, lines 5-10), mention, teach or provide means to diagnose catalyst performance during the time period immediately following cold engine starting based upon catalyst temperature data.

1. Rejection of claims 1, 2, 7-9, 11-16, 18, 20, 29-31, 36, 38-40, and 43-46 under 35 USC § 103(a)

Claims 1, 2, 7-9, 11-16, 18, 20, 29-31, 36, 38-40, and 43-46 stand rejected under 35 USC § 103(a) as being anticipated by Maus et al. (U.S. Patent 5,610,844) in view of Pelters et al. (US Patent 5,435,172). This rejection is respectfully traversed. For the following reasons, claims 1, 2, 7-9, 11-16, 18, 20, 29-31, 36, 38-40, and 43-46 are patentable over Maus et al in view of Pelters.

To establish prima facie obviousness, all the claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981 (CCPA 1974). All words in a claim must be considered in judging the patentability of that claim against the prior art." In re Wilson, 424 F.2d 1385 (CCPA 1970). (See MPEP § 2144.03.) All the words of the claim must be considered and given weight. No words in a claim can be ignored.

Maus et al. fails to anticipate or render obvious claims 1, 2, 7-9, 11-16, 18, 20, 29-31, 36, 38-40, and 43-46 for at least the reason that Maus et al. does not disclose, teach or suggest, each and every element and limitation of the claims. In particular, Maus et al. does not disclose a method of diagnosing a catalyst including "controlling changes to conditions of **selected individual engine cylinders**" as recite in amended claims 1, 2, 7-9, 11-16, 18, 20, 29-31, 36, 38-40, and 43-46 (emphasis added). Nor does Maus et al. teach or suggest such a limitation.

Rather, Maus et at. discloses a system that introduces excess fuel **equally to all cylinders** at a desired level to diagnose a catalyst. As noted above, as with all the references there is no disclosure in Maus of "controlling changes to conditions of **selected individual engine cylinders**", and this has been admitted by the Examiner at page 4 of the Non-Final Office Action

Maus et al. discloses a method of catalyst diagnosis that uses a "brief injection of additional fuel with a simultaneous switching off of the ignition" and thus a momentary disabling of the ignition system voltage to the engine's spark plugs to cause an unburned fuel and air mixture to exit the engine's exhaust. (See Maus et al. at, for example, col. 8, lines 16-29). Maus teaches that the "electronic control...**controls the engine** through control **lines**" so that the "operational condition of the internal combustion **engine** is briefly disrupted ... . This can take place ... by a brief injection of additional fuel **while simultaneously switching off the ignition** during a load phase." (See Maus et al. at Col. 8, lines 16-23). Maus et al. mentions injection of additional fuel, but says nothing about controlling changes to conditions of selected individual engine cylinders. Rather, Maus et al. discloses a system that controls the "engine 1" by multiple "control lines 9" such that **all individual cylinders' are controlled alike**. As shown in Fig. 1 of Maus et al., there is no detail to engine 1 and the control lines 9 are not designated for any particular purpose. Because Maus et al. teaches his system is responsive to the exhaust gases of **all** engine cylinders, it is therefore unable to control the quantity of fuel to **selected individual cylinders** as has been disclosed by the Applicant, nor is it inherent in Maus et al. Maus et al. fails to disclose, teach or suggest anywhere that the individual cylinders of the engine are set independently to gas and air flows different from one another as is taught by the present invention. Further, Maus explicitly states at col. 8, lines 21-23 that the system will "simultaneously switching off of the ignition ... ." Maus requires such disabling the ignition in order to provide unburned oxygen gases in the catalyst since his " brief injection of additional fuel" cannot alone provide exhaust gases' conditions sufficient to raise the catalysts' temperature. Therefore, Applicant respectfully submits that Maus fails to teach or suggest controlling changes to the conditions of **selected individual cylinders** as indicated in amended claims 1, 2, 7-9, 11-16, 18, 20, 29-31, 36, 38-40, and 43-46 of the present invention, and the claims are not rendered obvious by Maus et al. for at least the reason that Maus fails to teach or suggest each and every limitation of the claims.

Pelters et al. fails to make up for the deficiencies of Maus et al. Pelters discloses a process that tests the operating efficiency of exhaust gas catalysts by switching off the ignition to thereby create an exhaust gas pulse. (See Pelters et al. at, for example, Col. 2; lines 46-50 and Col. 4, lines 52-54). In order to obtain catalyst testing results, therefore, Pelters et al. uses ignition (spark) control (i.e., shuts off the spark) to all cylinders to create an "exhaust gas pulse" that is output from at least one cylinder to the catalyst. Further, the disclosure of Pelters et al. is ambiguous as to whether its process is capable of controlling conditions of selected individual cylinders. The Examiner references col. 2, lines 45-50 and 55-66 to support that Pelters et al. teaches changing conditions of selected individual cylinders. Applicant respectfully disagrees. Pelters et al. states at col. 2, lines 45-50 that "During coasting operation, in which the fuel supply is normally interrupted, the exhaust gas pulse can be generated, for example, by the injection of fuel into at least one cylinder, the ignition of which may be switched off for this purpose." Applicant believes that this is at best an ambiguous statement from which one skilled in the art would conclude that the resulting "injection of fuel into at least one cylinder" (that being **a random cylinder, not a "selected" cylinder**) results from the ignition being turned off during a time such that any fuel entering any one of the cylinders (a random cylinder or cylinders, not a selected individual cylinder) during the time only when the ignition is also turned off so that all cylinder's gases will flow to the catalyst without being burned. This is not controlling changes to the conditions of "**selected** individual engine cylinder(s)" as disclosed and claimed in the present invention.

Further, the fuel injection system 4 shown in Figure 1 of Pelters et al. and the signal carrying line 9 connected to the fuel injection system 4 are shown as single components rather than individual components related to each respective cylinder (e.g., a 4 cylinder engine), more consistent with a single injector (e.g., throttle body) engine fuel injection system **where one injector provides the fuel for all cylinders and intake valves** and rotation of a cam shaft and a crankshaft determine which cylinder receives the fuel at any particular time. Although Pelters et al. in the Detailed Description at col. 4, lines 46-64 says "ignition of a cylinder of the internal combustion engine is switched off for two rotations' which may seem to suggest that the fuel control may be achieve for selected individual cylinders, Applicant respectfully submits that, given the entirety of the Pelters et al. disclosure, this ambiguous description would be reasonably interpreted by one skilled in the art as being a method of introducing excess oxygen into the

catalyst by the specific disabling of the ignition. As such, the process of Pelters et al. operates by both turning off the ignition to all cylinders and during that time activates at least one injection valve to provide fuel from injection system 4 to only one cylinder (at a time appropriate) and simultaneously activating all fuel injection valves, but only introducing fuel to one of the cylinders (**at random and not selected specifically**). The fact Pelters discloses that "during a second rotation, the injection valve of the fuel injection system 4 assigned to this cylinder is activated by the control unit 8", does not preclude all fuel injector valves operating at that same time, because the position of the crankshaft rotation and corresponding camshaft rotation will open only one intake valve at any point in time for a 4 cylinder engine. In essence, the disclosure of Pelters et al. would be interpreted by one skilled in the art as having only two states for all fuel injectors, all on or all off. As such, the disclosure of Pelters at col. 4, lines 46-64, is more correctly interpreted to indicate that for a short period of time, during the two crankshaft rotations (four cycle engine) when the ignition is off, all the injection valves of fuel injection system 4 (e.g., one or more fuel injectors) will be turned on by control unit 8, and a random one of the cylinders (not a selected cylinder) will receive fuel without spark, such that an exhaust gas pulse having excessive fuel will be fed to the gas catalyst 7. In fact, unlike the present invention, it is clear that the process of Pelters et al., like Maus et al., necessarily turns off the ignition at times so that fuel entering the cylinders will not be burned and is exhausted to the catalyst. As properly construed by one skilled in the art, the comments related to "at least one cylinder" identified by the Examiner, simply relates to the amount of time in which the ignition should be turned off, and during that time **at least one random cylinder** receives fuel without spark so that an unburned fuel pulse is provided to the catalyst. Thus, as correctly interpreted, the disclosure of Pelters et al. fails to make up the deficiencies of Maus et al.

Based on the aforementioned, Applicant respectfully submits that both Maus et al. and Pelters et al. fail to teach or suggest controlling changes to the conditions of **selected individual cylinders** as indicated in amended claims 1, 2, 7-9, 11-16, 18, 20, 29-31, 36, 38-40, and 43-46 of the present invention, and the claims are not rendered obvious by Maus et al. and Pelters et al., whether taken individually or in combination, for at least the reason that Maus et al. and Pelters et al. fails to teach or suggest each and every limitation of the claims.

To establish prima facie obviousness, all the claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981 (CCPA 1974). All words in a claim must

be considered in judging the patentability of that claim against the prior art." In re Wilson, 424 F.2d 1385 (CCPA 1970). (See MPEP § 2144.03.) "Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion, or incentive supporting the combination." In re Geiger, 815 F.2d 686, 688, 2 USPQ2d 1276, 1278 (Fed. Cir. 1987) citing ACS Hospital Systems, Inc. v. Montefiore Hospital, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984). The test for obviousness is whether the combined teachings of the prior art, taken as a whole, suggest the modification to the person of ordinary skill in the art. In re Napier, 55 F.3d 610, 34 USPQ2d 1782 (Fed. Cir. 1995). Absent such a showing in the prior art, the examiner has impermissibly used the applicant's teaching to hunt through the prior art for the claimed elements and combined them as claimed, i.e., the examiner has impermissible used hindsight. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991); In re Bond, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990); In re Laskowski, 871 F.2d 115, 10 USPQ2d 1397 (Fed. Cir. 1989). The Examiner may not reject claims without an explanation as the where and how the references discloses, teaches, or suggest each and every limitation of the claim and how the references would be reasonably combined.

With respect to claim 7, claim 7 is also patentable over Maus et al. in view of Pelters et al. for at least the additional reason that neither Maus et al. nor Pelters et al. does not disclose, teach or suggest determining whether the catalytic converter is malfunctioning by using the first temperature characteristic and the second temperature characteristic for modifying changes in gas concentrations entering said catalyst from an engine. It is telling that the Examiner fails to even discuss claim 7 specifically in her rejection. The Board must reverse the Examiner's rejection of claim 7 for at least the reason that the Examiner has failed to provide any evidence or explanation related to the rejection and how the references relate to the particular language of the claim.

In any case, the present invention may modify the quantity or frequency of the exhaust's various gases' individual constituents, such as CO or oxygen, based on any temperature characteristic. On the other hand, Maus only teaches that a change in the quantity or frequency of the unburned fuel and air mixture may be selected to differ from all conceivable operationally caused changes in order to associate a measured temperature characteristics with that change versus more steady state catalyst conditions during normal engine operation when all cylinders' outputs are similar. (See Maus et al. at Col. 4, lines 5-24). Maus et al. fails to indicate anywhere

that the quantity or frequency of the exhaust's various gases' individual constituents may be selected based on a measured temperature characteristic. Pelters et al. does not discuss this aspect of the process at all. The Examiner has failed to provide any evidence or reasoning as to why claim 7 is rejected. Therefore, Applicant respectfully submits that the Board must reverse and remand the rejection of claim 7, or require the Examiner to reopen prosecution so as to point to a place in Maus et al. or Pelters et al. that shows modifying the changes in gas concentrations based on measured temperature characteristics.

With respect to claim 8, claim 8 is also patentable over Maus et al. in view of Pelters et al. for at least the additional reason that Maus et al. does not disclose that a design of a catalytic converter is selected to provide consistent (to increase the consistency of diagnosis) and discernment of differences between ... malfunctioning and marginally good catalytic converters, as recited in claim 8. Rather, Maus discloses that the accuracy of a ***given*** catalytic converter, especially those of greater lengths, may be increased by measuring temperature at multiple locations or partial volumes of ***given*** catalytic converter. (See Maus et al. at, for example, Col. 5, lines 8-18). Maus makes no mention of selecting shorter length catalytic converters to improve the accuracy of its diagnosis, but only of increasing the number of temperature sensors when the length of the catalytic converter increases. (See Maus et al. at Col. 8, lines 52-56). Nor does Maus address selecting a close coupled catalytic converter design to provide for consistent results from a catalyst's diagnosis during cold start heating where shorter lengths aid such heating, independent of said diagnosis' accuracy, or a method to distinguish malfunctioning catalysts from marginally good catalysts. Furthermore, once again, the Examiner failed to state where in Pelters et al. such aspects of the present invention are discussed. Therefore, Applicant respectfully submits that both Maus and Pelters fails to render obvious claim 8 for at least the reason that both Maus et al. and Pelters et al., together or separate, fails to disclose each and every limitation of the claim.

With respect to claim 9, the Examiner again failed to establish a prima-facie case of obviousness and did not indicate why or how claim 9 is shown by Maus et al. and/or Pelters et al. Therefore, the Board must reverse the Examiner's rejection of claim 9 for at least the reason that the Examiner has failed to provide any evidence or explanation related to the rejection related to the particular language of the claim.

With respect to claim 16, claim 16 is also patentable over Maus et al. in view of Pelters et al. for the additional reason that neither Maus et al. nor Pelters et al. disclose, teach or suggest determining a third temperature characteristic ***after disabling the change in exhaust gas concentrations*** ... so as to confirm test condition consistency, as recited in claim 16. Again, the Examiner fails to give any statement as to where Pelters et al. discloses such aspects of the invention; for good reason, **because it doesn't**. On the other hand, Maus et al. merely discloses taking temperature measurements "***during changes of the chemical and/or physical properties of the gas mixture***" at multiple *locations*. (See Maus et al. at, for example, Col. 4, lines 57-64). Maus fails to disclose taking any subsequent temperature measurements ***after*** the changes of chemical and/or physical properties of the gas mixture so as to confirm test condition consistency. Applicant respectfully requests the Board to reverse the Examiner's rejection of claim 16 or remand the case to the Examiner to point to where in Maus et al. or Pelters et al. there is a particular statement supporting the unpatentability of claim 16, because Maus et al. in view of Pelters et al. fails to disclose, teach or suggest each and every limitation of claim 16.

With respect to claim 20, claim 20 is patentable over Maus et al. in view of Pelters et al. for the additional reason that Maus et al. and Pelters et al. do not disclose, teach or suggest "causing cycling of exhaust air-fuel ratio characteristics between rich and lean" as recited in claim 20. Rather, as mentioned above, Maus only teaches causing a "brief injection of additional fuel," which merely causes exhaust air-fuel ratio characteristics to become richer for a brief moment before returning to stoichiometric. (See Maus et al., for example, at Col. 8, lines 15-22). There is no cycling in Maus. Maus fails to indicate anywhere that exhaust air-fuel ratio characteristics cycle between rich and lean. Once again, the Examiner fails to point to anywhere in Pelters et al. where this exists, because it is not disclosed, taught or suggested by Pelters et al. Therefore, Applicant respectfully submits that Maus in view of Pelters et al. fails to render claim 20 obvious for the additional reason that both Maus et al. and Pelters et al. fails to disclose, teach or suggest each and every limitation of the claim, and asks the Board to reverse the Examiner's decision and allow claim 20.

With respect to claim 30, the Examiner again failed to establish a prima-facie case of obviousness and did not indicate why or how claim 30 is shown by Maus et al. and/or Pelters et al. Therefore, the Board must reverse the Examiner's rejection of claim 30 for at least the reason

that the Examiner has failed to provide any evidence or explanation related to the rejection related to the particular language of the claim.

With respect to claim 36, claim 36 is patentable over Maus et al. in view of Pelters et al. for the additional reason that neither Maus et al. nor Pelters et al. disclose, teach or suggest a method for ***increasing heating rates*** of a catalytic converter by detecting at least one operational condition "prior to entering stoichiometric engine operation after cold start, and controlling changes in exhaust gases' concentrations entering said catalyst...***upon initiation*** of catalyst chemical exothermic activity" as recited in claim 36. Rather, Maus only teaches that "it is possible to ***check*** various aspects of the operation of the catalytic converter" by observing the derivative of a temperature characteristic. (See Maus et al. at, for example, Col. 8, lines 2-6). Maus discloses a method of ***"checking" the diagnosis*** of the catalytic converter by observing whether "the start of the catalytic reaction" and the measurement of the temperature probes is consistent with the diagnostic results. (See Maus et al. at, for example, Col. 8, lines 2-15). Maus, therefore, fails to disclose, teach or suggest detecting the start of the catalytic reaction for the purpose of heating the catalytic converter ***at a faster rate*** after cold start. Nor does Maus disclose use of an engine close coupled catalyst design where the length of the first catalyst may be too short, due to rapid cold start heating requirements, to allow such additional temperature probes. Maus' detection of the start of the catalytic reaction serves a different purpose than the present invention; so Maus also fails to disclose controlling changes in exhaust gases' concentrations entering the catalyst ***upon*** said detection. Maus fails to disclose relating the time that the "operational condition of the internal combustion engine is briefly disrupted" to the determination of the start of the catalytic reaction. (See Maus et al. at, for example, Col. 8, lines 16-20). And once again, the Examiner is silent about this claim and the Pelters et al. disclosure. For good reason, because Pelters et. al. fails to teach or suggest such limitations. Therefore, Applicant respectfully submits that Maus and Pelters fail to render claim 36 obvious for the additional reason that both Maus et al. and Pelters fail to disclose, teach or suggest each and every limitation of the claim, and respectfully requests the Board to allow claim 36.

With respect to claim 38, claim 38 is also patentable over Maus et al. in view of Pelters et al. for the additional reason that neither Maus et al. nor Pelters et al. disclose, teach, or suggest disabling changes in exhaust gas concentrations upon measuring conditions indicating catalyst temperature conditions are approaching defined values, as recited in claim 38. Maus et al. is

directed to diagnosing the condition of a catalyst by changing exhaust gas concentrations with an injection of additional fuel ***for a brief moment and simultaneous switching off of the ignition***. (See Maus et al. at, for example, Col. 8, lines 16-21). Not only does Maus fail to disclose disabling said changes for any reason, but the changes occur nearly instantaneous so as to be practically incapable of being disabled. Again, the Examiner has failed to state anything about Pelters et al. disclosing this aspect of the present invention, because it does not exist. Applicant respectfully requests the Board to allow claim 38 or require the Examiner to point to where in Maus et al. or Pelters et al. there is a particular statement supporting the obviousness of claim 38.

With respect to claim 39, the Examiner again failed to establish a prima-facie case of obviousness and did not indicate why or how claim 39 is shown by Maus et al. and/or Pelters et al. Therefore, the Board must reverse the Examiner's rejection of claim 39 for at least the reason that the Examiner has failed to provide any evidence or explanation related to the rejection related to the particular language of the claim.

With respect to claim 40, claim 40 is also patentable over Maus et al. in view of Pelters et al. for the additional reason that Maus et al. and Pelters et al. do not disclose, teach or suggest that a catalytic converter design can be selected to increase the accuracy of its diagnosis or discernment of temperature, as recited in claim 40. Rather, Maus discloses that the accuracy of a ***given*** catalytic converter, especially those of greater lengths, may be increased by measuring temperature at multiple locations or partial volumes of ***given*** catalytic converter. (See Maus et al. at, for example, Col. 5, lines 8-18). Maus makes no mention of altering the design of the catalytic converter by, for example, selecting shorter length catalytic converters to improve the accuracy of its diagnosis or its ability to heat rapidly after cold engine starting, but only discloses increasing the number of temperature sensors when the length of the catalytic converter increases. (See Maus et al. at, for example, Col. 8, lines 52-56). Similarly, Pelters et al. does not discuss this aspect of the present invention, and the Examiner fails to suggest that it does. Therefore, Applicant respectfully submits that both Maus and Pelters fails to render claim 40 obvious for the additional reason that both Maus et al. and Pelters et al. fails to disclose, teach or suggest each and every limitation of the claim.

With respect to claim 44, the Examiner again failed to establish a prima-facie case of obviousness and did not indicate why or how claim 44 is shown by Maus et al. and/or Pelters et al. Therefore, the Board must reverse the Examiner's rejection of claim 44 for at least the reason

that the Examiner has failed to provide any evidence or explanation related to the rejection related to the particular language of the claim.

With respect to claim 45, the Examiner again failed to establish a prima-facie case of obviousness and did not indicate why or how claim 45 is shown by Maus et al. and/or Pelters et al. Therefore, the Board must reverse the Examiner's rejection of claim 45 for at least the reason that the Examiner has failed to provide any evidence or explanation related to the rejection related to the particular language of the claim.

With respect to claim 46, claim 46 is also patentable over Maus et al. in view of Pelters et al. for the additional reason that neither Maus et al. nor Pelters et al. disclose, teach or suggest modifying the starting point for changing the conditions of exhaust gases entering a catalyst based upon prior determinations of the catalyst's condition, as recited in claim 46. Maus fails to disclose, teach or suggest relating the time that the "operational condition of the internal combustion engine is briefly disrupted" to any prior determinations of the catalyst's condition. (See Maus et al. at, for example, Col. 8, lines 16-20). Again, the Examiner fails to indicate anywhere in Pelters that discloses such unique aspects of the present invention, because there is none. Therefore, Applicant respectfully submits that Maus and Pelters fails to render claim 46 obvious for at least the reason that both Maus et al. and Pelters et al. fail to disclose, teach or suggest each and every limitation of the claim.

Based on the aforementioned, Applicant respectfully submits that claims 1, 2, 7-9, 11-16, 18, 20, 29-31, 36, 38-40, and 43-46 are not rendered obvious by Maus et al. in view of Pelters et al., and are patentable for at least the reasons given above. Therefore, Applicant respectfully requests the Board reverse the Examiner and indicate that claims 1, 2, 7-9, 11-16, 18, 20, 29-31, 36, 38-40, and 43-46 are allowable.

2. Rejection of claims 24-26 and 28 under 35 USC § 103(a)

The Examiner rejected claims 24-26, and 28 under 35 USC § 103(a) as being unpatentable over Fujimoto et al. (US Patent 5,591,905) in view of Pelters et al. This rejection is respectfully traversed. For the following reasons, claims 24-26, and 28 are patentable over Fujimoto et al. in view of Pelters et al.

Fujimoto et al. fails to anticipate claims 24-26, and 28 for at least the reasons that Fujimoto et al. does not disclose each and every limitation of the claims and the Examiner has used impermissible hindsight reasoning for combining the references.

To establish prima facie obviousness, all the claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981 (CCPA 1974). All words in a claim must be considered in judging the patentability of that claim against the prior art." In re Wilson, 424 F.2d 1385 (CCPA 1970). (See MPEP § 2144.03.) "Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion, or incentive supporting the combination." In re Geiger, 815 F.2d 686, 688, 2 USPQ2d 1276, 1278 (Fed. Cir. 1987) citing ACS Hospital Systems, Inc. v. Montefiore Hospital, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984). The test for obviousness is whether the combined teachings of the prior art, taken as a whole, suggest the modification to the person of ordinary skill in the art. In re Napier, 55 F.3d 610, 34 USPQ2d 1782 (Fed. Cir. 1995). Absent such a showing in the prior art, the examiner has impermissibly used the applicant's teaching to hunt through the prior art for the claimed elements and combined them as claimed, i.e., the examiner has impermissible used hindsight. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991); In re Bond, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990); In re Laskowski, 871 F.2d 115, 10 USPQ2d 1397 (Fed. Cir. 1989).

In particular, Fujimoto et al. does not disclose "controlling a change in fuel quantity to at least one **selected individual cylinder**" as included in claims 24-26, and 28. Nor does Fujimoto et al. teach or suggest such a limitation. Rather, Fujimoto et at., like Maus et al., discloses a system that introduces changes in fuel quantity **equally to all cylinders** to diagnose a catalyst. Fujimoto fails to disclose changing fuel quantities of **selected individual cylinders** as it designates an air-fuel ratio control for "carrying out of air-fuel ratio **of the engine**." (See Fujimoto et al. at, for example, Fig. 3 and Col. 5, lines 5-7 and lines 15-17). Further evidence of Fujitmoto's failure to disclose said limitation is provided in that an intake pipe supplies a [single] **mixture** to the **engine** to be injected by **an [single] injector** (rather than multiple injectors as disclosed in the present invention). (See Fujimoto et al. at, for example, Fig. 3 and Col. 5, lines 34-41). As noted in Fujimoto et al. at col. 9, lines 5-7, a single fuel injector signal J is disclosed where "the fuel injection signal J is set to be longer, and the air-fuel ratio is set on the rich side." When referring to the system in Fig. 3, Fujimoto et al. at col. 5, lines 37-40, describes that "4 is

an intake manifold mounted at a connecting portion between the downstream side of the intake pipe 3 and the engine 1, and 5 is **an injector** mounted in the upstream of the intake pipe 2 to inject fuel." Therefore, it is clear that Fujimoto et al. discloses a system that controls the "engine" such that **all individual cylinders' are controlled alike with one (an) injector 5**. Because Fujimoto et al. teaches his system is responsive to the exhaust gases of **all** engine cylinders, it is therefore unable to control the quantity of fuel to **selected individual cylinders** as has been disclosed by the Applicant. The fact is that **Fujimoto et al. fails to indicate anywhere that the individual cylinders of the engine are set independently to gas and air flows different from one another** as is taught by the present invention. Fujimoto et al. does not specifically discuss that the ignition is turned off at any particular point, but does indicate the ignition coil 13 is connected to a power transistor for conduction and cutting off the ignition coil 13 and has an interruption signal INT that is provided to the microcomputer 100. (See Fujimoto at col. 5, lines 52-60 and col. 6, lines 25-30.) Thus, it is possible that the ignition may be turned off to produce an increase in unburned fuel to the catalyst in Fujimoto. Therefore, Applicant respectfully submits that Fujimoto fails to teach or suggest changing the conditions of "**selected individual cylinders**" as included in the limitations of claims 24-26, and 28 of the present invention and the claims are not anticipated (or rendered obvious) by Fujimoto et al. for at least the reason that Fujimoto fails to teach or suggest each and every limitation of the claims.

As mentioned above, it is clear that Pelters et al. uses the turn off of ignition operation to provoke a change in catalyst temperature. And, as explained above, Pelters does not clearly show selecting individual cylinders as required by the claims. The disclosure of Pelters in this respect is contradictory and confusing, and ambiguous at best. Further, the Examiner only provides conclusions as to how or why one skilled in the art would combine Fujimoto with Pelters to obtain the invention claimed in claims 24-26 and 28, stating that it would be "for more efficient controlling the air fuel ratio to judge a condition of the catalyst." This does not explain why or how one would select various aspects of Pelters and Fujimoto to combine their systems in the particular and precise way necessary to obtain the combination of elements and limitations claimed herein by the Applicant. In this case, the Examiner has used impermissible hindsight reasoning to do so and has used general reasoning without any showing of motivation or suggestion for the particular combination. There is no suggestion or motivation in the art or the references in this case for doing such a combination in the particular manner necessary to

achieve the claimed invention. Further, there is no evidence other than the Examiner's bald statement that combining some or all of the system or process of Pelters would result in a more efficient controlling of the air fuel ratio in a way that would allow a better judgment of the condition of the catalyst.

Claims 24-26, and 28 are also patentable over Fujimoto et al. in view of Pelters et al. for at least the additional reason that Fujimoto et al. and Pelters do not disclose "cycling an oxygen sensor's output prior to stoichiometric closed loop fuel control operation" as included in claims 24-26, and 28. Rather, Fujimoto merely ***detects*** a change in oxygen sensor output as it "reads the air-fuel ratio signals V1 and V2" upon determining that the catalytic converter has reached a "temperature which can provide efficient oxidation/reduction." (See Fujimoto et al. at, for example, Col 10, lines 24-25, Col. 9, lines 26-29, and lines 36-52). Fujimoto fails to disclose enabling *any* changes prior to stoichiometric closed loop fuel control as no further steps are taken if the catalytic converter is not at an efficient temperature. (See Fujimoto et al., for example, at Col. 10, lines 21-27). Fujimoto instead discloses a system that depends upon stoichiometric closed loop control as it requires "a state suitable for deciding deterioration of the catalytic converter, that is, a steady state of the engine." (See Fujimoto et al., for example, at Col. 10, lines 1-9). As evidenced by the lack of transient measurements occurring in the early stages of Figure 7 when operating rich, in contrast to the present invention's Figure 4, Fujimoto fails to disclose taking steps to toggle the oxygen sensor before stoichiometric closed loop control. (See Fujimoto et al. at, for example, Figure 7). Any toggling of the oxygen sensor in the system disclosed by Fujimoto is due to the engine having reached stoichiometric closed loop control. As evidenced by the Examiner's lack of discussion about Pelters relative to these limitations, Pelters does not even discuss these features. Therefore, Applicant respectfully submits that Fujimoto and Pelters fail to disclose, teach or suggest "cycling an oxygen sensor's output prior to stoichiometric closed loop fuel control operation" as included in claims 24-26, and 28 of the present invention and the claims are not rendered obvious by Fujimoto et al. in view of Pelters for at least the reason that Fujimoto and Pelters fail to disclose, teach or suggest each and every limitation of the claims.

Further, one skilled in the art would not reasonably combine Pelters with Fujimoto et al. The Examiner's reasoning that one skilled in the art would combine Pelters in Fujimoto to provide an effective controlling of the air fuel ration to judge a condition of the catalyst is pure

speculation and form over substance, because there is no certainty that combining these two distinct systems would prove useful or more effective. That the combined systems might work together is not enough to motivate one skilled in the art to combine them, because combining them would increase the number of components and the cost of the diagnosis system. There is no showing in the references or by the Examiner that combining the references in the manner necessary would result in a better performing catalyst diagnosis, or one that is so much better that it offsets the additional cost of combining the components of each of the systems being combined.

Based on the aforementioned, Applicant respectfully submits that claims 24-26, and 28 are not rendered obvious by Fujimoto et al. and/or Pelters, and are patentable for at least the reasons given above. Therefore, Applicant respectfully requests the Board reverse the Examiner and indicate that claims 24-26 and 28 are allowable.

3. Rejection of claims 3-6 under 35 USC § 103(a)

The Examiner rejected claims 3-6 under USC § 103 (a) as being unpatentable over Maus et al. (US Patent 5,610,844) in view of Pelters et al. (US Patent 5,435,172) as applied to claim 1, and further in view of Holl (US Patent 3,785,151). This rejected is respectfully traversed. For the following reasons, claims 3-6 are patentable over Maus et al. in view of Pelters, and in further view of Holl.

Applicant respectfully submits that the Examiner has failed to make a prima facie case of obviousness and that claims 3-6 are unpatentable over Maus et al. in view of Pelters et al. (US Patent 5,435,172), in further view of Holl, because the reference fails to teach each and every limitation of claims 3-6. Further, Applicant respectfully submits that there is no teaching, suggestion or motivation, nor reasonable basis, for combining the references in the manner suggested by the Examiner.

To establish prima facie obviousness, all the claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981 (CCPA 1974). All words in a claim must be considered in judging the patentability of that claim against the prior art." In re Wilson, 424 F.2d 1385 (CCPA 1970). (See MPEP § 2144.03.) "Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching,

suggestion, or incentive supporting the combination." In re Geiger, 815 F.2d 686, 688, 2 USPQ2d 1276, 1278 (Fed. Cir. 1987) citing ACS Hospital Systems, Inc. v. Montefiore Hospital, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984). The test for obviousness is whether the combined teachings of the prior art, taken as a whole, suggest the modification to the person of ordinary skill in the art. In re Napier, 55 F.3d 610, 34 USPQ2d 1782 (Fed. Cir. 1995). Absent such a showing in the prior art, the examiner has impermissibly used the applicant's teaching to hunt through the prior art for the claimed elements and combined them as claimed, i.e., the examiner has impermissible used hindsight. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991); In re Bond, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990); In re Laskowski, 871 F.2d 115, 10 USPQ2d 1397 (Fed. Cir. 1989).

Claims 3-6 depend upon claim 1, and thus have all the limitations of claim 1. As noted above, Maus et al. and Pelters et al. fails to teach or suggest the claimed invention of claims 3-6 for at least the reason that it does not show "controlling changes to conditions of **selected individual engine cylinders**" Holl fails to make up the deficiencies of Maus et al. and Pelters et al. because, like Maus et al. and Pelters et al., it fails to disclose, teach, or suggest controlling **changes to conditions of selected individual engine cylinders** for diagnosing a catalyst. Rather, Holl recirculates exhaust gases directly into the exhaust manifold so as to introduce recirculated exhaust gases **equally to all cylinders**. (See Holl at, for example, Col. 2, lines 28-33; Col. 3, lines 10, 16). Further, Holl is silent about, and fails to even relate to, diagnosing a catalyst, and thus would need to rely on the disclosure of Maus and Pelters in this respect. Both Maus and Pelters disclosed turning off the ignition for increasing the fuel provided to diagnose the catalyst. Therefore, Holl does not help to teach or suggest controlling conditions of "**selected individual engine cylinders**" as required by claim 1, and the claims are patentable over Maus et al., Pelters, and Holl, either individually or in combination, for at least this reasons.

Further, there is no suggestion or motivation for combining Maus et al. in view of Pelters et al., and in further view of Holl, particularly for the purpose of claims 3-6. At least one embodiment of the present invention in claims 3-6 is directed to changing concentrations of nitrogen oxide(s) gases at the catalyst in order to ***determine whether the operation of the catalyst is malfunctioning***. Holl, however, is directed at changing concentrations of nitrogen oxides(s) gases at the catalyst for the ***sole purpose of decreasing a catalyst's temperature for over-temperature protection to the catalytic converter***. (See Holl at, for example, Col. 3, lines

10-26). Holl also teaches away from the claimed invention by teaching that "only a relatively small percentage of the exhaust gases" are recycled. (See Holl at, for example, Col. 1, lines 50-54). That the invention embodied in claims 3-6 may require recycling large amounts of nitrogen oxide(s) in order to detect a change in temperature provides further evidence of a lack of suggestion or motivation to combine Maus et al., Pelters et al., and Holl to achieve the claimed invention. Therefore, without more, one skilled in the art would not be motivated to combine Maus et al., with Pelters et al., and with Holl to achieve the invention of claims 3-6.

The Examiner has here offered a conclusion that appears to be Official Notice rather than reasoning, stating that one skilled in the art would combine Holl with Maus and Pelters to provide an "efficiently controlling the air fuel ratio, so as to improve the exhaust gas pollution control." (See Non-Final Office Action at page 7.) This is conclusion and pure speculation, placing form over substance, because there is no certainty that combining these three distinct systems would prove useful or more effective. That the combined systems might work together for a defined general goal of improved exhaust gas pollution control is not enough to motivate one skilled in the art to combine them, because combining them would increase the number of components and the cost of the system. There is no showing in the references or by the Examiner that combining the references in the manner necessary would result in a better performing exhaust gas pollution control, or a system that is so much better that it offsets the additional cost of combining the components of each of the three systems being combined.

With respect to claim 4, the Examiner again failed to establish a prima-facie case of obviousness and did not indicate why or how claim 4 is shown by Maus et al., Pelters et al., and/or Holl. Therefore, the Board must reverse the Examiner's rejection of claim 4 for at least the reason that the Examiner has failed to provide any evidence or explanation related to the rejection related to the particular language of the claim.

With respect to claim 5, claim 5 is also patentable over Maus et al. and Pelters et al. for at least the additional reason that Maus et al. and Pelters et al. do not disclose that a catalytic converter design can be selected to improve the accuracy of its diagnosis or discernment of temperature, as recited in claim 5. Rather, Maus and Pelters disclose that the accuracy of a ***given*** catalytic converter, especially those of greater lengths, may be increased by measuring temperature at multiple locations or partial volumes of ***given*** catalytic converter. (See Maus et al. at, for example, Col. 5, lines 8-18). Maus (nor Pelters) makes no mention of selecting shorter

length catalytic converters to improve the accuracy of its diagnosis, but only of increasing the number of temperature sensors when the length of the catalytic converter increases. (See Maus et al. at, for example, Col. 8, lines 52-56).

Again, Holl fails to make up these deficiencies of Maus et al. and Pelters et al. Holl does not disclose selecting a catalytic converter design to make detection of a malfunctioning catalyst more accurate. Therefore, Applicant respectfully submits that Maus and Holl, either individually or combined, fail to render obvious claim 5 for at least the reason that Maus et al., Pelters et al., and Holl fail to disclose, teach or suggest each and every limitation of the claim.

With respect to claim 6, the Examiner again failed to establish a prima-facie case of obviousness and did not indicate why or how claim 6 is shown by Maus et al., Pelters et al., and/or Holl. Therefore, the Board must reverse the Examiner's rejection of claim 6 for at least the reason that the Examiner has failed to provide any evidence or explanation related to the rejection related to the particular language of the claim.

Based on the aforementioned, Applicant respectfully submits that claims 3-6 are not rendered obvious over Maus et al. in view of Pelters, and in further view of Holl and are patentable for at least the reasons given above. Therefore, Applicant respectfully requests the Board reverse the Examiner and indicate that claims 3-6 are allowable.

4. Rejection of claim 19 under 35 USC § 103(a)

The Examiner rejected claim 19 under USC § 103 (a) as being unpatentable over Maus et al. (US Patent 5,610,844) in view of Pelters et al. as applied to claim 11, and in view of Fujimoto (US Patent 5,591,905). This rejected is respectfully traversed. For the following reasons, claim 19 is patentable over Maus et al. in view of Pelters, in further view of Fujimoto et al.

Applicant respectfully submits that Examiner has failed to make a prima facie case that claim 19 is unpatentable over Maus et al. in view of Pelters et al., and in further view of Fujimoto, because the references fail to teach or suggest each and every limitation of the claim 19. Further, the Examiner has failed to indicate how or why one skilled in the art would combine the teachings of Maus et al., Pelters et al., and Fujimoto et al., in the exact manner necessary to achieve the claimed invention as defined by claim 19. Such a combination is highly unlikely to be supported by any reasonable basis for selecting only the particular aspects of each disclosure

to achieve the claimed invention. Applicant respectfully submits that the Examiner has failed to provide such a reasonable basis here and asks the Board to reverse the rejection of claim 19.

Claim 19 depends upon claims 1, 9, and 11, and thus has all the limitations of claims 1, 9, and 11. As noted above, Maus et al. and Pelters et al. fails to teach or suggest the claimed invention of claim 19 for at least the reason that it does not show "controlling changes to conditions of **selected individual engine cylinders** ... ." Fujimoto fails to make up the deficiencies of Maus et al. because, like Maus et al., it fails to disclose, teach, or suggest controlling changes to conditions of selected individual engine cylinders for diagnosing a catalyst. Rather, as explained in more detail above, Fujimoto designates an air-fuel ratio control for "carrying out of air-fuel ratio of the **engine**." (See Fujimoto et al. at, for example, Col. 5, lines 5-7; Col. 5, lines 15-17.) Further evidence of Fujitmoto's failure to disclose said limitations is provided in that an intake pipe supplies a single **mixture** to the **engine** to be injected **by a single injector** (rather than multiple injectors as disclosed in the present invention). (See Fujimoto et al. at, for example, Col. 5, lines 34-41).

As noted above, there is no reasonable basis, motivation, or suggestion for combining Fujimoto with Pelters in the manner necessary to obtain the claimed limitations. This is also true for combining Maus, Pelters, and Fujimoto. The Examiner's reasoning that one skilled in the art would combine Fujimoto with Maus and Pelters to "provide an effective means for monitoring a working condition of the catalyst" (see Non-Final Office Action at page 8), is pure speculation and form over substance because there is no certainty that combining these three distinct systems would prove useful or more effective. That the combined systems might work together is not enough to motivate one skilled in the art to combine them, because combining them would increase the cost of the diagnosis system. There is no showing in the references or by the Examiner that combining the references in the manner necessary would result in a better performing catalyst diagnosis, or one that is so much better that it offsets the additional cost of combining the components of each of the systems being combined. Therefore, Maus, Pelters, and Fujimoto do not teach or suggest, individually or in any reasonable combination, controlling conditions of "**selected individual engine cylinders** ... ." as required by claim 19 (as well as 1, 9, and 11, which claim 19 depends upon), and claim 19 is thereby patentable over Maus et al., Pelters et al, and Fujimoto, either individually or in combination.

Based on the aforementioned, Applicant respectfully submits that claim 19 is not rendered obvious over Maus et al. in view of Pelters et al, and in further view of Fujimoto et al., and is patentable for at least the reasons given above. Therefore, Applicant respectfully requests the Board reverse the Examiner and indicate that claim 19 is allowable.

5. Rejection of claim 27 under 35 USC § 103(a)

The Examiner rejected claim 27 under USC § 103 (a) as being unpatentable over Fujimoto et al. (US Patent 5,591,905) and Pelters et al. as applied to claim 24, in further view of Yamashita et al. (US Patent 5,727,383). This rejected is respectfully traversed. For the following reasons, claim 27 is patentable over Fujimoto et al. in view of Pelters et al., and in further view of Yamashita et al.

Applicant respectfully submits that once again the Examiner has failed to make a prima facie case that claim 27 is unpatentable over Fujimoto et al. in view of Pelters, and in further view of Yamashita et al., because the references fail to teach each and every limitation of the claim 27. Further, Applicant respectfully submits that there is no suggestion, motivation, or reasonable basis for combining the three references in the manner suggested by the Examiner.

Claim 27 depends upon claim 24, and thus has all the limitations of claim 24. As noted above, Fujimoto et al. and Pelters et al. fails to teach or suggest the claimed invention of claim 24 for at least the reason that it does not show "controlling a change in fuel quantity to at least one **selected individual cylinder ... .**" Yamashita fails to make up the deficiencies of Fujimoto et al. because, like Fujimoto et al., Yamashita fails to disclose, teach, or suggest controlling changes to conditions of selected individual engine cylinders. Rather, Yamashita creates "an air-fuel mixture of a predetermined air-fuel ratio...[and] **the mixture** is fed to each cylinder" so as to introduce the same air-fuel mixture **equally to all cylinders**. (See Yamashita et al. at, for example, Col. 5, lines 1-13). Therefore, Yamashita does not teach or suggest controlling conditions of "**selected individual cylinders**" as required by claims 24 and 27, and the claims are patentable over Fujimoto et al. and Yamashita et al., either individually or in combination.

Further, there is no suggestion or motivation for combining Fujimoto et al. in view of Pelters et al., and in further view of Yamashita, particularly for the purpose of claim 27. Rather than point to suggestion or motivation described in the references, the Examiner appears to take

Official Notice that one skilled in the art would combine the reference, particularly with respect to combining Yamashita that utilizes oxygen sensor based diagnosis (rather than temperature sensor based according to the claimed invention). This use of Official notice is traversed and the Applicant respectfully request the Examiner to point to where within the Yamashita reference there is suggestion or motivation, or provide some other evidence to show why and how one skilled in the art would reasonably combine Yamashita with Fujimoto and Pelters in the manner necessary to disclose each and every element and limitation of claim 27.

Yamashita discloses a method of ***determining*** catalyst activation on the basis of oxygen sensor ***feedback, after closed loop control***. (See Yamashita et al. at, for example, Col. 6, lines 40-44). Yamashita first checks to ensure that "at a time t3, air-fuel ratio feedback control is started" and only after closed loop is started "at a time t4, a check is made to see if the...catalytic converter is activated on the basis of the delay in the inverting period of the downstream O2 sensor." (See Yamashita et al. at, for example, Col. 6, lines 40-44). The method disclosed in Yamashita et al. is only capable of determining catalyst activation *after* closed loop control *on the basis of oxygen sensor feedback*. At least one embodiment of the present invention in claim 27, however, is directed to ***confirming*** catalyst activation on the basis of oxygen sensor ***cycling, before closed loop control (outside a stoichiometric control range after cold start)***. The method disclosed in at least one embodiment of the present invention in claim 27 is capable of determining catalyst activation *before* closed loop control *on the basis of catalyst temperature* and confirming catalyst activation *before* closed loop control *on the basis of oxygen sensor cycling*, irrespective of oxygen sensor feedback. Pelters fails to disclose operating before closed loop control. Therefore, without more, one skilled in the art would not combine Fujimoto et al., Pelters, and Yamashita et al. to achieve the invention of claim 27 because there is no suggestion or motivation for combining these three references in the manner necessary to meet the language of the claim.

Here, the Examiner has failed to provide a reasonable basis as to how or why one skilled in the art would combine the teachings of Fujimoto et al., Pelters et al., and Yamashita et al. in the exact manner necessary to achieve the claimed invention as defined by claim 27. Such a combination is highly unlikely to be supported by any reasonable basis for selecting only the particular aspects of each disclosure to achieve the claimed invention. Rather, the Examiner has here again offered a conclusion rather than reasoning (what appears to be Official Notice),

stating that one skilled in the art would have combined the systems disclosed by the references because if would have "provided an effective means for determining the catalyst activation condition." (See Non-Final Office Action at page 8.) The Examiner's reasoning that one skilled in the art would combine Fujimoto with Maus and Pelters to "provide an effective means for monitoring a working condition of the catalyst" (see Non-Final Office Action at page 8.), is pure speculation and form over substance because there is no evidence or certainty that combining these three distinct systems would prove useful or more effective. That the combined systems might work together is not enough to motivate one skilled in the art to combine them, because combining them would necessarily increase the cost of the diagnosis system. There is no showing in the references or by the Examiner that combining the references in the manner necessary would result in a better performing catalyst activation or diagnosis, or one that is so much better that it offsets the additional cost of combining the components of aspects of all of the systems being combined. Applicant respectfully submits that the Examiner has failed to provide such a reasonable basis here and has simply stated a purpose by conclusion (i.e., Official Notice out of necessity so as to support her rejection) for trying to combine the systems of Fujimoto, Pelters, and Yamashita.

Based on the aforementioned, Applicant respectfully submits that claim 27 is not rendered obvious over Fujimoto et al. in view of Pelters, and in further view of Yamashita et al., and is patentable over them for at least the reasons given above. Therefore, Applicant respectfully requests the Board reverse the Examiner and indicate that claim 27 is allowable.

6. Rejection of claims 32 and 33 under 35 USC § 103(a)

The Examiner rejected claims 32 and 33 under USC § 103 (a) as being unpatentable over Maus et al. (US Patent 5,610,844) in view of Pelters et al. as applied to claim 20 (and claim 1), and in further view of Yamashita et al. (US Patent 5,727,383). This rejected is respectfully traversed. For the following reasons, claims 32 and 33 are patentable over Maus et al. in view of Pelters et al., and in further view of Yamashita et al.

Applicant respectfully submits that Examiner has failed to make a prima facie case that claims 32 and 33 are unpatentable over Maus et al. in view of Pelters et al., and in further view of Yamashita et al. because the references fail to disclose, teach or suggest each and every

limitation of the claims 32 and 33. Further, Applicant respectfully submits that there is no suggestion, motivation, or reasonable basis for combining the references in the manner suggested by the Examiner.

Here again, the Examiner has failed to adequately explain why and how such a three way combination would reasonably occur. Rather, the Examiner simply provides a general objective for combining the references, and fails to indication how one skilled in the art would combine the teachings of Maus et al., Pelters et al., and Yamashita et al. in the exact manner necessary to achieve the claimed invention as defined by claims 32 and 33. Such a combination is highly unlikely to be supported by any reasonable basis for selecting only the particular aspects of each disclosure to achieve the claimed invention. Applicant respectfully submits that the Examiner has failed to provide such a reasonable basis or detailed indication here, but only provides a general objective for the combination. Such an approach in not sufficient to support a rejection based on obviousness, and Applicant respectfully request the Board to reverse the Examiner's rejection.

Claims 32 and 33 depend upon claim 29, and thus have all the limitations of claim 29. As noted extensively above, Maus et al. fails to disclose, teach or suggest the claimed invention of claims 32 and 33 for at least the reason that it does not show "controlling changes to conditions of **selected individual engine cylinders ...** ." Yamashita fails to make up the deficiencies of Maus et al. and Pelters (as described above) because, like Maus et al., Yamashita fails to disclose, teach, or suggest controlling changes to conditions of selected individual engine cylinders. Rather, as noted above, Yamashita creates "an air-fuel mixture of a predetermined air-fuel ratio...[and] **the mixture** is fed to each cylinder" so as to introduce the same air-fuel mixture **equally to all cylinders**. (See Yamashita et al. at, for example, Col. 5, lines 1-13). Further, the Yamashita fails to discuss or disclose anything about operating selected individual engine cylinders without turning off ignition operation. Therefore, Yamashita does not disclose, teach or suggest controlling conditions of "**selected individual cylinders ...** " as stated in claim 29, and the claims are patentable over Maus et al. in view of Pelters et al., and in further view of Yamashita et al., either individually or in combination.

Further, there is no suggestion or motivation for combining Maus et al. in view of Pelters et al., and in further view of Yamashita, particularly for the purpose of claims 32 and 33. As explained in detail above, Yamashita discloses a method of determining catalyst activation on the

basis of ***oxygen sensor feedback, after closed loop control***. (See Yamashita et al. at, for example, Col. 6, lines 40-44). Yamashita first checks to ensure that "at a time t3, air-fuel ratio feedback control is started" and only after closed loop is started "at a time t4, a check is made to see if the...catalytic converter is activated on the basis of the delay in the inverting period of the downstream **O2 sensor**." (See Yamashita et al. at, for example, Col. 6, lines 40-44). The method disclosed in Yamashita et al. is only capable of determining catalyst activation *after* closed loop control *on the basis of oxygen sensor feedback*. There is no suggestion, motivation, or reasonable basis in any of Maus et al., Pelters et al., or Yamashita et al., or in the knowledge of one skilled in the art, for combining the references in the manner necessary to achieve all the elements and limitations of claims 32 and 33 of the present invention, and the Examiner fails to point to any. Rather, the Examiner has relied upon what appears to be a loose explanation based on Official Notice and a general objective. This is respectfully traversed and Applicant respectfully requests the Examiner to come forward with some evidence to support the proposition for combining Maus et al., Pelters et al., and Yamashita et al. in the manner necessary to render claims 32 and 33 obvious.

One again, the Examiner has offered a conclusion rather than reasoning (what appears to be Official Notice), stating that one skilled in the art would have combined the systems disclosed by the references because if would have "provided an effective means for determining the catalyst activation condition." (See Non-Final Office Action at page 9.) Note, this is the same reason given above by the examiner for combining three different references that include Fujimoto et al. (rather than Maus et al.). The Examiner's reasoning that one skilled in the art would combine Yamashita with Maus and Pelters to "provide an effective means for determining the catalyst activation condition" (see Non-Final Office Action at page 9), is again pure speculation and form over substance because there is no evidence or certainty that combining these three distinct systems would prove useful or more effective. That the combined systems might work together is not enough to motivate one skilled in the art to combine them, because combining them would necessarily increase the cost of the diagnosis system. There is no showing in the references or by the Examiner that combining the references in the manner necessary would result in a better determining the catalyst activation condition or catalyst diagnosis, or one that is so much better that it offsets the additional cost of combining the components of aspects of all of the systems being combined.

Therefore, Applicant respectfully submits that without more, one skilled in the art would not combine Maus et al., Pelters et al. and Yamashita et al. to achieve the invention of claims 32 and 33. Therefore, Applicant respectfully requests the Board reverse the Examiner and indicate that claims 32 and 33 are allowable.

7. Rejection of claim 50 under 35 USC § 102(b)

The Examiner again rejected claim 50 under 35 USC § 102(b) as being anticipated by Yamashita et al. (US Patent 5,727,383). This rejection is again respectfully traversed. For the following reasons, claim 50 is patentable over Yamashita et al.

"Anticipation can only be established by a single prior art reference which discloses each and every limitation of the claimed invention." RCA Corp v. Applied Digital Data Systems, Inc., 730 F.2d 1440, 1444, 221 USPQ 385, 388 (Fed. Cir. 1984). In other words, if any claimed element is missing from the prior art reference, it cannot anticipate the claimed invention. Kloster Speedsteel AB v. Crucible Inc., 793 F.2d 1565, 1571 (Fed. Cir. 1986). Furthermore, "there is no anticipation 'unless all of the same elements are found in exactly the same situation and united in the same way ...in a single prior art reference.'" Perkin-Elmer Corp. v. Computervision Corp., 732 F.2d 888, 894, 221 USPQ 669, 673 (Fed. Cir. 1984) (citing Kalman v. Kimberly-Clark Corp., 713 F.2d 760, 771, 218 USPQ 781, 789 (Fed. Cir. 1983). In the present patent application, the Examiner fails to show all elements as arranged in claim 50 are disclosed in the single Yamashita et al. reference.

Yamashita et al. fails to anticipate claim 50 for at least the reason that Yamashita et al. does not disclose, teach or suggest each and every element and limitation of the claim. There are three different reasons why claim 50 is patentable over Yamashita et al., and Applicant believes each one is an independent and sufficient reason for patentability. Yamashita et al. does not disclose (1) a method for diagnosing a condition of a catalyst while compensating for engine power changes; (2) controlling said device for compensating adverse changes in cylinder intake airflow; and (3) use of specified conditions stored in memory. It is noteworthy that the Examiner does not point to anywhere in Yamashita that discloses these limitations of the claims, but only points to col. 10, lines 1+ in Yamashita, with no specificity. (See Non-Final Office Action at pages 1-2.) The Examiner has the burden to prove the existence of all the claim limitations exist

in one reference. Given the grave deficiencies in the Examiner's rejection of claim 50, for efficiency reasons, Applicant will focus their details argument on only one of the three reasons why claim 50 is not anticipated by Yamashita. As such, claim 50 is not anticipated (or rendered obvious) by Yamashita et al., for at least the following reason (as well as the other two reasons identified above).

In particular, Yamashita et al. does not disclose "controlling said device for ***compensating*** adverse changes in cylinder intake airflow" as recited in claim 50. Rather, Yamashita discloses a device that ***measures*** airflow and intake air quantity in order to detect catalytic converter deterioration. (See Yamashita et al. at, for example, Col. 2, lines 3-22; Col. 9, lines 57-61; Col 10, lines 12-19, lines 35-55). Instead of compensating for ***instantaneous*** airflow as in the present invention embodied in claim 50, Yamashita measures the ***accumulated*** airflow to estimate the quantity of heat required to reach catalyst activation (See Yamashita et al. at, for example, Col. 2; lines 3-22; Col. 10, lines 35-55). Yamashita, therefore, does not disclose, teach or suggest a method for diagnosing a catalyst by detecting catalyst temperature changes, but instead, measures accumulated airflow up to a certain catalyst temperature. Therefore, Applicant respectfully submits that Yamashita fails to disclose "controlling said device for ***compensating*** adverse changes in cylinder intake airflow" as included in claim 50 of the present invention and the claim is not anticipated (or rendered obvious) by Yamashita et al. for at least the reason that Yamashita fails to disclose, teach or suggest each and every limitation of the claim. Therefore, based on the aforementioned points, Applicant respectfully requests the Board to reverse the Examiner's rejection of claim 50 and render claim 50 allowable.

8. Rejection of claim 51 under 35 USC § 102(b)

The Examiner rejected claim 51 under 35 USC § 102(b) as being anticipated by Pelters et al. (US Patent 5,435,172). This rejection is respectfully traversed. For at least the following reasons, claim 51 is patentable over Pelters et al.

"Anticipation can only be established by a single prior art reference which discloses each and every limitation of the claimed invention." RCA Corp v. Applied Digital Data Systems, Inc., 730 F.2d 1440, 1444, 221 USPQ 385, 388 (Fed. Cir. 1984). In other words, if any claimed element is missing from the prior art reference, it cannot anticipate the claimed invention.

Kloster Speedsteel AB v. Crucible Inc., 793 F.2d 1565, 1571 (Fed. Cir. 1986). Furthermore, "there is no anticipation 'unless all of the same elements are found in exactly the same situation and united in the same way ...in a single prior art reference.'" Perkin-Elmer Corp. v. Computervision Corp., 732 F.2d 888, 894, 221 USPQ 669, 673 (Fed. Cir. 1984) (citing Kalman v. Kimberly-Clark Corp., 713 F.2d 760, 771, 218 USPQ 781, 789 (Fed. Cir. 1983). In the present patent application, the Examiner fails to show all elements as arranged in claim 51 are disclosed in the single Pelters et al. reference.

Pelters et al. fails to anticipate claim 51 for at least the reason that Pelters et al. does not disclose, teach or suggest each and every limitation of the claim. In fact, the Examiner never indicates with any specificity that Pelters et al. does disclose each and every limitiation of claim 51. It is noteworthy that the Examiner does not point to anywhere in Pelters that discloses the limitations of the claims, but only points to col. 2, lines 10+, and col. 4, lines 18+, in Yamashita, with no specificity. (See Non-Final Office Action at page 3.) As such, the Board must reverse the Examiner's rejection of claim 51 for failing to indicate with any specificity how and where in Pelters each and every limitation of claim 51 can be found. In any case, Applicant provides the following explanation of some of the specific claim limitation not disclosed in Pelters et al.

In particular, Pelters et al. does not disclose causing "the temperature of the catalyst to rapidly rise when...engine operational conditions preclude establishing stoichiometric closed loop fuel control operation" as recited in claim 51. Rather, Pelters discloses a process that tests the operating efficiency of exhaust gas catalysts by switching off the ignition to thereby create an exhaust gas pulse. (See Pelters et al. at, for example, Col. 2; lines 46-50 and Col. 4, lines 52-54). In order to obtain catalyst testing results, therefore, Pelters et al. must turn off the ignition to create an exhaust gas pulse. Further, in Pelters et al., the engine is operating in an idling state or coasting state. (See Pelters et al. at, for example, Col. 2; lines 26-45 and Col. 4, lines 43-51). As such, in both cases, the engine in Pelters et al. is operating in closed loop fuel control operation, though it may be doing so while being either under-stoichiometric or over-stoichiometric as a result of the exhaust pulse. On the other hand, as recite in claim 51 the engine operations are occurring when conditions preclude establishing stoichiometric closed loop fuel control operation (e.g., just after a cold start condition before closed loop fuel control operation can begin).

As noted above, the Examiner rejects claim 51 repeating the claim language and using a very general reference to col. 2, line 10+ and col. 4, line 18+, without providing any specificity. This approach is in direct opposition to the law and is hereby objected to by the Applicant. Therefore, Applicant respectfully requests the Board to allow claim 51 or instruct the Examiner to reopen prosecution and point to where in Pelters et al. there are particular disclosures supporting the anticipation of claim 51 for each and every limitation of the claim.

SUMMARY

In view of the foregoing, Applicant (Appellant) respectfully submits that the claimed invention in claims 1-9, 11-16, 18-20, 24-33, 36, 38-40, 43-46, 50 and 51 are not anticipated nor made obvious in view of the cited references within the meaning of § 102 and § 103. Therefore, the Board of Appeals reversal of the Examiner's rejections is respectfully requested. Applicant further respectfully requests that the application be remanded to the Examiner with an instruction to withdraw the rejections of all of claims 1-9, 11-16, 18-20, 24-33, 36, 38-40, 43-46, 50 and 51 under § 102 and § 103, and the case with all the claims be allowed, and passed to issue at the earliest possible time. As noted in the Non-Final Office Action, claims 10, 17, 21-23, 34, 35, 37, 41, 42 and 47-49 all contain allowable subject matter.

Please notify the undersigned as soon as possible if there is any additional fee(s) that may be necessary for the institution of this Appeal or the continued pendency of this application.

Respectfully submitted,

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APPENDIX OF CLAIMS

1. A method of diagnosing a catalyst, including the steps of:

detecting at least one parameter indicating operating conditions are sufficient for producing reliable diagnostic test results;

determining a first temperature characteristic of the catalyst;

controlling a change in gas concentrations entering the catalyst by controlling changes to conditions of selected individual engine cylinders connected to said catalyst so as to provide chemical conditions sufficient for increasing the catalyst temperature above the first temperature;

determining a second temperature characteristic of the catalyst; and

comparing changes between the first temperature characteristic and the second temperature characteristic to determine whether the catalyst is malfunctioning.

2. A method according to claim 1, further including the steps of:

determining a first derivative and a second derivative for the first temperature characteristic and the second temperature characteristic; and

determining if the catalyst is malfunctioning by using at least one of the first derivative and the second derivative.

3. A method according to claim 1, whereby the step of controlling a change in exhaust gas concentrations includes controlling a quantity of residual exhaust gases entering an engine's cylinder so as to modify concentrations of nitrogen oxide(s) gases at the catalyst and assists determining whether the operation of said catalyst is malfunctioning based upon changes in temperature from the first temperature characteristic and the second temperature characteristic.

4. A method according to claim 3, whereby the controlling the quantity of residual exhaust gases entering an engine's cylinder is selected only during operational conditions minimizing associated changes in exhaust gas concentrations of HC and CO gases following the controlled change of residual gas quantities entering an intake.

5. A method according to claim 3, further including the step of selecting a catalytic converter design, including the catalyst, so that the determining whether the operation of said catalytic converter is malfunctioning is more accurately detected.

6. A method according to claim 3, whereby engine power changes caused by said controlling the quantity of residual exhaust gases entering an engine's cylinder are compensated for by use of a device for electrically controlling engine airflow changes based upon operator power demands.

7. A method according to claim 1, wherein determining whether the catalytic converter is malfunctioning uses the first temperature characteristic and the second temperature characteristic for modifying changes in gas concentrations entering said catalyst from an engine.

8. A method according to claim 1, where a design of a catalytic converter that includes the catalyst is selected such that the step of comparing changes between the said first temperature characteristic and the second temperature characteristics provide consistent and discernible differences between when the comparing is made using at least one reference catalytic converter known to be malfunctioning and at least one reference catalytic converter that is known to be marginally good.

9. A method according to claim 1, wherein the step of controlling a change in gas concentrations includes controlling a change in steady state gas concentrations.

10. A method according to claim 9, whereby the step of controlling a change in steady state gas concentrations is accomplished by operating selected individual cylinders of an engine under rich conditions while introducing oxygen into exhaust gases entering said catalyst.

11. A method according to claim 9, wherein the step of controlling a change in steady state gas concentrations is caused by cycling air-fuel ratio characteristics of the gases entering the catalyst so as to provide conditions sufficient for modifying the rate of catalyst heating.

12. A method according to claim 11, whereby the air-fuel ratio characteristics of the gases' entering said catalyst are controlled to have frequency and magnitude characteristics selected so as to minimize perceptible changes in engine vibration.

13. A method according to claim 1, wherein the step of controlling a change in gas concentrations is achieved by changing the amount of fuel flow into an engine cylinder that is coupled to the catalyst.

14. A method according to claim 1, wherein the step of determining a first temperature characteristic includes measuring at least one first instantaneous temperature point and the step of determining a second temperature characteristic includes measuring at least one second instantaneous temperature point.

15. A method according to claim 1, where said change in gas concentrations entering said catalyst is selected to compensate for catalyst deterioration so as to minimize toxic air pollutants emitted from the vehicle's tailpipe.

16. A method according to claim 1 whereby a third temperature characteristic of the catalyst is determined after disabling the change in exhaust gas concentrations so as to verify catalyst temperature conditions have return to those determined for the first temperature characteristic so as to confirm test condition consistency before updating a catalyst diagnostic status.

17. A method according to claim 1, wherein the catalyst is coupled to an engine and the diagnostic test is performed with stabilized engine conditions by use of a device for electrically controlling engine airflow change based upon operator power demands.

18. A method according to claim 1, wherein the characteristics for determining whether the condition of said catalytic converter is malfunctioning are modified based upon measured characteristics from at least one catalyst temperature sensor following cold engine starting.

19. A method according to claim 11, whereby the characteristics for determining whether the condition of said catalytic converter is malfunctioning, during said modifying the rate of catalyst heating following cold engine starting, are modified based upon monitoring an output of one or more oxygen sensor(s) while controlling temporary changes in gas conditions to provide detectable differences between the oxygen sensor(s) outputs.

20. A method of catalytic converter diagnostics, including the steps of:

detecting during a first time period a first engine operational condition and at least one engine parameter indicating consistent diagnostic results are obtainable;

controlling changes to conditions of selected individual engine cylinders, differing from the first engine operational condition, for causing cycling of exhaust air-fuel ratio characteristics between rich and lean during a second time period; and

monitoring a catalyst temperature changes occurring between the first time period and the second time period so as to determine if the catalytic converter is malfunctioning.

21. A method according to claim 20, wherein the step of enabling changes is accomplished by operating selected individual cylinders under rich conditions while introducing oxygen into engine exhaust gases entering the catalytic converter so as to cause the catalyst temperature changes.

22. A method according to claim 21, wherein the introducing oxygen into the exhaust gases is accomplished using electronically controlled engine valves and a system for causing pressures in an engine intake manifold to exceed those in an engine exhaust manifold.

23. A method according to claim 20, whereby the catalytic converter diagnostic test is performed with stabilized engine conditions by use of a device for electrically controlling engine airflow change based upon operator power demands.

24. A method of cycling an oxygen sensor's output prior to stoichiometric closed loop fuel control operation to allow modifying the diagnosis of a catalyst's condition based upon cold start conditions, including the steps of:

monitoring engine exhaust gases with an oxygen sensor;

detecting at least one parameter indicating engine operation outside a stoichiometric control range after a cold start;

controlling a change in fuel quantity to at least one selected individual cylinder such quantity estimated to cause a defined oxygen sensor output change;

modifying said quantity estimated for said change in fuel to subsequent selected individual cylinder(s) until causing a defined change in said oxygen sensor's output; and

repeating the steps for controlling a change and modifying the quantity so as to cause repetitive cycling of the oxygen sensor output about a defined threshold until at least one engine parameter reaches a predetermined value.

25. A method according to claim 24, whereby repetitive cycling of the oxygen sensor's output conditions following cold engine starting is used to assess catalytic converter operation.

26. A method according to claim 24, whereby the repetitive cycling an oxygen sensor's output is caused by enabling changes in fuel quantity to multiple selected individual cylinders for causing the output of an oxygen sensor monitoring engine exhaust gases to fluctuate about a defined control point.

27. A method according to claim 24, whereby said repetitive cycling an oxygen sensor's output is used to confirm initiation of catalyst chemical exothermic activity by monitoring outputs of a first oxygen sensor located before a catalytic converter and a second oxygen sensor located after the catalytic converter.

28. A method of cycling an oxygen sensor's output prior to stoichiometric closed loop fuel control operation during cold start conditions, including the step of:

controlling a change in fuel quantity to at least one selected individual cylinder that will cause the output of the oxygen sensor monitoring engine exhaust gases to traverse a defined control point.

29. A method for increasing heating rates of a catalytic converter after cold engine starting, including:

providing at least one temperature sensor coupled to the catalytic converter;

detecting at least one operational condition determining initiation of catalyst chemical exothermic activity; and

controlling changes in exhaust gases' concentrations entering said catalyst by controlling changes to conditions of selected individual engine cylinders connected to said catalyst so as to provide chemical conditions sufficient for increasing the rate of catalyst heating.

30. A method according to claim 29, wherein said determining initiation of catalyst chemical exothermic activity is provided from catalyst temperature characteristics.

31. A method according to claim 30, wherein said determining initiation of catalyst chemical exothermic activity provided from catalyst temperature characteristics includes derivatives of said temperature characteristics with respect to time.

32. A method according to claim 30, wherein said determining initiation of catalyst chemical exothermic activity is confirmed by detecting changes in exhaust gases' concentrations from a gas sensor(s) positioned to detect gases exiting said catalytic converter.

33. A method according to claim 30, wherein said determining initiation of catalyst chemical exothermic activity is confirmed by monitoring outputs of a first oxygen sensors located before the catalytic converter and a second oxygen sensors located after the catalytic converter, while controlling temporary changes in exhaust gas conditions to provide for catalyst heating and detectable differences between the said first and second oxygen sensor outputs.

34. A method according to claim 30, wherein the step of controlling changes in exhaust gases' concentrations includes controlled changes being based upon prior determinations of catalytic converter conversion efficiency performance.

35. A method according to claim 30, wherein the step of controlling changes in exhaust gases' concentrations entering said catalyst includes enabling controlling changes, before said step of determining initiation of catalyst chemical exothermic activity, based upon stored engine parameter values from prior engine cold starts.

36. A method according to claim 30, wherein detecting at least one operational condition occurs prior to entering stoichiometric engine operation after a cold start, and controlling changes in exhaust gases' concentrations entering said catalyst is implemented upon initiation of catalyst chemical exothermic activity based on at least one engine parameter.

37. A method according to claim 30, wherein during said step of controlling changes in exhaust gases' concentrations, the controlled changes are modified based upon prior determinations of at least one engine parameter following cold start conditions in order minimize toxic air pollutants.

38. A method according to claim 30, further including the step of:

measuring at least one engine operational condition indicating catalyst temperature conditions are approaching defined values and disabling changes so as to cause increasing the rate of catalyst heating.

39. A method according to claim 30, wherein during the step of said controlling changes in exhaust gases' concentrations, the controlled changes are modified to allow A/F cycling operation at any defined average A/F ratio by using a wide range linear type oxygen sensor for engine feedback control.

40. A method according to claim 30, wherein said determining initiation of catalyst chemical exothermic activity is made more discernable using catalyst temperature characteristics by selection of particular catalytic converter design characteristics.

41. A method according to claim 30, wherein during said step of controlling changes in exhaust gases' concentrations, the controlled changes are modified based upon prior determinations of catalytic converter performance characteristics.

42. A method according to claim 30, wherein said step of controlling changes in exhaust gases' concentrations entering catalyst is enabled after a specified change in at least one engine control parameter, such change occurring following said determining initiation of catalyst chemical exothermic activity.

43. A method of at least one of heating and diagnosing a catalytic converter of an internal combustion engine, comprising the steps of:

providing at least one temperature sensor in said catalytic converter;

sensing at least one condition sufficient for determining initiation of exothermic chemical reactions within the said catalytic converter; and

changing quantities of chemically reactive gases entering said catalytic converter by controlling changes to conditions of selected individual engine cylinders connected to said catalyst so as to increase the rate of catalyst heating to a temperature sufficient to reduce pollutants exiting said catalytic converter.

44. A method according to claim 43, wherein said step of changing quantities of chemically reactive gases entering said catalytic converter includes varying fuel and air conditions input to selected individual engine cylinders of said internal combustion engine.

45. The method according to claim 43, wherein prior determined results from said step of sensing of conditions producing exothermic chemical reactions are used to modify the selected magnitudes of exhaust gases' air-fuel ratio.

46. The method according to claim 43, wherein results from prior determinations of the catalytic converter's condition are used to modify both the starting point for said changing quantities of chemically reactive gases and their magnitudes to heat the catalyst.

47. A method according to claim 43, wherein said one condition sufficient for determining initiation of said heating includes catalyst temperature changes after a first temperature condition caused by operator power demands have improved accuracy from use of a catalyst temperature modeling algorithm and by use of a device for allowing filtering of electrically controlled engine airflow changes, based upon operator power demands within a defined range, to reduce sources of errors in temperature modeling algorithms in the actual determination of the starting point of exothermic chemical reactions.

48. A method according to claim 47, wherein said filtering of driver power demands after engine cold starts is used to improve estimates of expected catalyst temperature changes from said temperature modeling.

49. A method according to claim 47, wherein said filtering of driver power demands after engine cold starts is used to improve discerning the starting point of initiation of catalyst exothermic heating during said method of heating a catalytic converter.

50. A method for diagnosing a condition of a catalyst while compensating for engine power changes, comprising the steps of:

providing a device for electrically controlling engine airflow changes;

controlling said device for compensating adverse changes in cylinder airflow by use of specified conditions stored in memory; and

diagnosing the condition of the catalyst.

51. A method of diagnosing a catalyst and reducing undesired gas emissions from the catalyst coupled to an internal combustion engine and a temperature sensor coupled to the catalyst by, including the steps of:

monitoring the catalyst temperature with the temperature sensor;

changing at least one operating parameter of the engine to cause the temperature of the catalyst to rapidly rise when the chemical exothermic activity has started in the catalyst and engine operational condition preclude establishing stoichiometric closed loop fuel control operation; and

changing at least one operating parameter of the engine to achieve said stoichiometric engine operation in exhaust gases when the catalyst has reached a temperature needed to establish stoichiometric engine operation.

APPENDIX OF EVIDENCE

None

APPENDIX OF RELATED PROCEEDINGS

None